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(54) Title: OPTICAL FIBER AMPLIFIER

(57) Abstract: Optical fibers (e.g., fiber lasers and fiber amplifiers), and systems containing such optical fibers are disclosed.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/24409

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01S 3/00

US CL : 359/334

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 359/334, 341.3, 341.32, 341.33, 337.4

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 5,406,411 (Button et al) 11 Apr. 1995 (11.04.1995), fig. 3.	1, 3, 5-7, 9-12, 22-27, 30-39, 41, 46-51
Y	US 5,815,518 (Reed et al) 29 September 1998 (29.09.1998), fig. 1 and fig. 6.	2, 4, 8, 13-21, 28-29, 40, 42-45
Y	US 6,292,288 B1 (Akasaka et al.) 18 September 2001 (18.09.2001), fig. 1	2, 4, 8, 13-21, 40, 42- 45 28-29
A	US 6,081,366 (Kidorf et al) 27 June 2000 (27.06.2000), fig. 6.	1-51
A	US 5,721,636 (Erdogan et al) 24 February 1998 (24.02.1998), fig. 2.	1-51
A	US 6,163,636 (Stentz et al) 19 December 2000 (19.12.2000), fig. 1.	1-51
E	US 2002/0024722 A1 (Tsuzaki et al) 28 February 2002 (28.02.2002), fig. 1.	1-51

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

Special categories of cited documents:	
* "A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* "B" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
* "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
* "O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
* "P" document published prior to the international filing date but later than the priority date claimed	

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/24409

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-51

Remark on Protest ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

PCT/US02/24409

### BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group 1, claim(s) 1-51, drawn to an optical fiber amplifier.

Group 2, claim(s) 52-73, drawn to an optical fiber amplifier with a double clad laser.

The inventions listed as Groups 1 and 2 do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: All of the groupings are drawn to optical fiber amplifiers but each group has a different special technical feature not shared by the remaining groups. Group 1 is directed to an optical fiber amplifier, which has the special technical feature of having 'first and second respective locations' configured to 'substantially prevent energy having an intermediate wavelength in the discrete portion from entering other discrete portions of the optical fiber'. Group 2 is directed to an optical fiber amplifier with two discrete portions wherein 'the first section is a double clad fiber laser, and the second section is an optical amplifier having a gain medium including  $\text{P}_2\text{O}_5$ '.